

REMARKS

Claims 11-14, and 16-22 are pending in the present application. Claims 11, 17, and 19 have been amended, Claims 12-14 and 16 remain withdrawn, no claims have been canceled, and Claim 23 has been added, leaving Claims 11 and 17-22 for consideration upon entry of the present Amendment and Response.

Allowable subject matter

Applicants wish to thank the Examiner for the allowance of the subject matter of Claim 21. Applicants believe that entry of the present amendment will fully address the Examiner's concerns and rejections over the remaining claims, and will also place them in condition for allowance.

Amendments to Claims

Claim 11 has been amended to positively and properly recite the claim as a method claim as required by the Examiner. Claims 17 and 19 have been amended to further properly recite a method claim and, in the case of Claim 17, to remove subject matter redundant to Claim 11. Support for the amendment to Claim 11 can be found in Claim 17 and in allowed Claim 21, and support for the amendments to Claim 19 can also be found in allowed Claim 21. No new matter has been introduced by these amendments.

New Claims

Claim 23 has been added to further claim the invention. Support for Claim 23 can be found at least in Claim 1 as originally filed, in Claims 11 and 17, and in allowed Claim 21.

Reconsideration and allowance of the claims is respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 11-14 and 17-20 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner states that

the claims lack recited method steps and in Claim 11 in particular that the claim recites an intended use in the preamble and not a true method. Accordingly, independent Claim 11 has been amended to correctly recite method steps of “applying a photoresist composition” and additional method steps for patterning the photoresist film as supported by Claim 17, which as amended recites limitations to the method steps of amended Claim 11. Claim 19 which depends from Claim 11 has been amended to correctly describe methods of coating. Amended in this way, these claims should now be acceptable to the Examiner. Accordingly, Applicants respectfully request the Examiner reconsider and withdraw the rejection.

Claim Rejections Under 35 U.S.C. §103(a)

Claims 11–14 and 16–20 are rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,346,799 (“Jeffries”) or U.S. Patent No. 5,324,620 (“Ebersole”), in view of U.S. Patent No. 5,853,949 (“Kodama”), U.S. Patent No. 5,346,799 (“Sheriff”), and U.S. Patent No. 6,232,031 (“Gracia”). Applicants respectfully traverse the rejection.

Jeffries teaches an alkali-soluble novolak binder resin made by the condensation reaction of a mixture of phenolic monomers. See Abstract. Ebersole teaches a radiation-sensitive composition dissolved in a solvent comprising (A) a photoactive compound; (B) an alkali-soluble novolak binder resin. See Abstract.

Kodama discloses a nitrogen-substituted polyphenol compound used in a photoresist composition along with an alkali soluble novolac compound. Col. 6, line 32 to Col. 7, line 5. Kodama teaches the use of surfactants in a positive working photoresist. Col. 11, lines 55–59.

Gracia teaches a positive-working coating composition comprising a novolak, resole, or polyvinyl resins with phenolic hydroxide groups, and o-diazonaphthoquinone. Col 2, line 53 to Col. 3, line 10. A surfactant (BYK 344) is disclosed. Col. 4, line 31.

Sheriff teaches infra-red imaging compositions containing only two essential components, a mixture of a phenolic resin and an o-diazonaphthoquinone derivative, a reaction product of a phenolic resin and an o-diazonaphthoquinone derivative, or a combination of these; and a non-basic infrared absorbing compound. Col. 3, lines 55-65.

Surfactants in “conventional amounts” are disclosed. Col. 7, lines 60-61. Sheriff teaches use of a polyether-modified polydimethylsiloxane surfactant (BYK-307). Col. 10, lines 8-10.

For an obviousness rejection to be proper, the Examiner is expected to meet the burden of establishing a *prima facie* case of obviousness, i.e., that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

For reasons of record put forth in the previous Amendment and Response filed January 4, 2007 and as maintained in light of the above amendments to instant Claims 11, 17, and 19 included to address the Examiner’s requirement under 35 U.S.C. § 112, second paragraph as above, and further as the Examiner has stated in the Office Action dated April 17, 2007 on p. 6, section 5, none of the cited references (Jeffries, Ebersole, Kodama, Gracia, or Sheriff) nor any combination of these discloses or teaches the claimed method of coating a photoresist by a multi-micro nozzle (MMN) coating head. See Jeffries, Col. 10, lines 64-67; Ebersole, Col. 12, lines 23-26; Kodama, Col. 13, lines 16-20; Gracia, Col. 3, line 66 to Col. 4, line 1; and Sheriff, Col. 8, lines 47-49. Thus, as the references do not disclose or teach the specific set of coating conditions including the MMN coating head and the large substrate, a combination of the above cited references would therefore fail to teach or disclose all elements and limitations of the method claimed in amended Claim 11. Further, none teach that the composition of the photoresist composition can be adjusted to prevent stain formation, when an MMN coating head is used to apply the photoresist composition onto a large substrate, and none teach or disclose controlling stains as claimed in Claim 11 by formulating the particular claimed components in proportions within the compositional ranges given that are

suitable to provide low cloud or stain defects, as determined functionally by coating large scale substrates (e.g., glass) with the claimed coating equipment (i.e., a multi-micro nozzle (MMN) head coater) composition.

While Applicants acknowledge the Examiner's requirement above that Claim 11 be amended to properly recite a method and have so amended Claim 11, Applicants nevertheless respectfully disagree with the Examiner that reciting coating the photoresist composition by an MMN head coater as claimed in Claim 11 prior to amending is merely an intended use and has no patentable weight. As argued previously and also of record, Applicants maintain that an inventive feature of the photoresist composition itself, claimed herein of preventing stains in the specific application of coating of large scale surfaces by MMN head coater, is a non-obvious functional limitation (hence is a compositional limitation) which governs formulation of the relative ratios of the disclosed components (polymer resin, diazide photoactivatable compound, organic solvent, and Si-based surfactant; and any crosslinker) within the claimed ranges, such that the synergies disclosed in the Specification as provided by the solvent and Si-based surfactant for the particular combination of components can be achieved.

Neither Kodama, Sheriff, nor Gracia provide a reason for one of ordinary skill in the art to modify Jeffries or Ebersole in the manner required to meet this functional limitation requirement. *In re Laskowski*, 871 F.2d 115, 117, 10 U.S.P.Q.2d 1397, 1398 (Fed. Cir. 1989) (“Although the Commissioner suggests that [the structure in the primary art reference] could readily be modified to form the [claimed] structure, ‘[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification’”’) (citation omitted); *In re Stencil*, 828 F.2d 751, 755, 4 U.S.P.Q.2d 1071, 1073 (Fed. Cir. 1987) (obviousness cannot be established “by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion that the combination be made”). There is no teaching or suggestions to combine elements of the prior art to produce the present invention. The photoresist composition itself meets this functional limitation requirement and is not obvious because none of the above references, nor the combination, teach to or disclose to combining the particular components of the references in their particular

proportions without the benefit of knowing the intended outcome of the prevention of stain formation, which would only be understood from impermissible hindsight. Thus there is no teaching or suggestion that would motivate one skilled in the art to combine the components of the individual references to provide the photoresist composition and photoresist film prepared therefrom, and the present invention is thus nonobvious.

In applying Section 103, the U.S. Court of Appeals for the Federal Circuit has consistently held that one must consider both the invention and the prior art “as a whole”, not from improper hindsight gained from consideration of the claimed invention. See, *Interconnect Planning Corp. v. Feil*, 227 U.S.P.Q. 543, 551 (Fed. Cir. 1985) and cases cited therein. According to the *Interconnect* court

[n]ot only must the claimed invention as a whole be evaluated, but so also must the references as a whole, so that their teachings are applied in the context of their significance to a technician at the time - a technician without our knowledge of the solution.

Id. Also critical to this Section 103 analysis is that understanding of “particular results” achieved by the invention. *Id.*

When, as here, the Section 103 rejection was based on selective combination of the prior art references to allegedly render a subsequent invention obvious, “there must be some reason for the combination other than the hind sight gleaned from the invention itself.” *Id.* Stated in another way, “[i]t is impermissible to use the claimed invention as an instruction manual or ‘template’ to piece together the teachings of the prior art so that the claimed invention is rendered obvious.” *In re Fritch* 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992).

Support for Applicant’s assertion of a lack of a teaching or suggestion in the references to the particular claimed combinations of solvent and surfactant to achieve particular results, i.e., to prevent stain formation which is recited as a compositional limitation to provide a desired outcome as claimed, and consequently also a lack of a reasonable expectation for success based on a strict combination of the cited references, has been argued and is of record in the previous Amendment and Response to the Office Action dated January 4, 2007. These arguments are provided hereinbelow and elaborated on for the Examiner’s further consideration. Jeffries and Ebersole both identically

disclose scum formation in the *imaged* photoresist upon exposure to basic developer, and elimination of the scum formation by using a novolak prepared by a synthesis and purification process that minimizes the presence of scum-forming oligomers (e.g., p-cresol dimer). Neither reference teaches a method that prevents stain formation, which as disclosed in the instant Specification is observable upon coating and prior to development. See Jeffries, Col. 3, lines 10-44; and Ebersole, Col. 3, lines 9-43 and Col. 19, lines 45-46; and the instant Specification on p. 11, lines 1-20, in FIGs 2 and 6A-E. Jeffries and Ebersole provide no basis for expecting the synergistic effect, described in the instant Specification on p. 11, lines 18-20, of preventing stain formation by use of the solvent system of the disclosed instant Examples and the silicon based surfactant as claimed, and thus do not provide a teaching or reasonable expectation that the large-surface staining can be prevented by coating the photoresist composition with an MMN head coater as claimed in the instant claims.

Jeffries and Ebersol both disclose Si containing surfactants; however, and as previously noted by the Examiner, each provide examples prepared using FLUORAD® FC-430, from 3M Company, which is a *fluorinated* organic surfactant and not a silicon-containing surfactant. Jeffries, Col. 15, lines 32-35; Ebersole, Col. 18, lines 48-50. It is thus unclear to one skilled in the art whether the examples of the references (Jeffries and/or Ebersol) teach the use a silicone-containing surfactant or a fluorocarbon as disclosed, as the examples explicitly teach a known fluorocarbon surfactant, and these references cannot therefore provide any guidance or clear teaching to one skilled in the art that a silicon-based surfactant would provide a reasonable expectation for success in a photoresist composition, particularly a photoresist composition optimized to provide a method of controlling stain formation as claimed in the instant claims.

Jeffries and Ebersole each provide as working examples compositions that are compositionally similar, not to Examples 1-3 disclosed in the instant Specification on p. 9 and as claimed embodiment of instant Claim 11, but rather to Comparative Example 1 in the Specification on p. 9, which specifically discloses use of a fluorine-containing surfactant (FC-430) and the undesired stain formation obtained therewith. Consequently, the examples of Jeffries and Ebersole teach a non-working, comparative example of the

instant Specification, and therefore would not be expected to provide the claimed stain-free coating, but rather would be expected to provide instead a stained photoresist film as shown in FIG. 6A of the instant Application, due to inclusion of fluorinated surfactant as taught. Jeffries and Ebersole therefore clearly cannot provide a teaching or suggestion that would direct one skilled in the art to the invention as claimed in the instant claims via the limitation of preventing stains in a photoresist film as coated by an MMN head coater with the particular synergistic photoresist composition claimed in the instant claims.

Kodama discloses testing for the presence of scum in post-develop testing of photoresist, but does not disclose prevention of stain formation in post-coated, pre-developed photoresist coated substrates by coating the photoresist composition claimed in the instant claims. Col. 23, line 57 to Col. 24, line 20. Kodama also teaches that a surfactant may be used in order to improve on coating properties such as striation, and discloses organosiloxane surfactants such as Shin-Etsu KP341, but fails to disclose the polyoxyalkylene dimethylpolysiloxane copolymer compound claimed in the instant Claims. Col. 11, lines 25-27. Spin-coat striations, alluded to in Kodama and as previously argued in the previous office action, are not identical or even comparable to the exemplary cloudy stains, pin stains, chuck stains, or center/lateral stains shown in FIG. 2 of the instant Specification as obtained by spray/spin. In addition, though Kodama discloses that a fluorine type and a silicon type surfactant are preferred, and discloses that the surfactant may be used alone or as a combination, Kodama does not disclose or teach use of the specific polyoxyalkylene dimethylpolysiloxane surfactants in instant Claim 11, and fails to distinguish between performance of fluorine type and silicon type surfactants. Col. 11, lines 50-61. In addition, though Kodama discloses specific solvents, Kodama does not disclose, teach, or suggest specific solvent composition or proportions as a factor in controlling coating defects, and fails to disclose particular such combinations of in particular PGMEA and EEP as claimed in the instant claims. Kodama, Col. 11, lines 1-18. Thus, Kodama fails to provide a teaching or suggestion that would direct one skilled in the art to the invention as claimed in the instant claims via the limitation of preventing stains in a photoresist film as coated by an

MMN head coater with the particular synergistic photoresist composition and solvent system claimed in the instant claims.

Sheriff and Gracia, which disclose silicone surfactants BYK 307 (Sheriff, Examples 1-11), and BYK 344 (Gracia, Examples 1-4) are each silent as to coating defect prevention of any kind, and therefore do not disclose or teach the prevention of stain formation in a coated photoresist film as claimed in Claim 11. Gracia discloses solvents and relative ratio of infrared absorbing dye to diazonaphthoquinone moiety, but fails to teach a synergistic combination of solvent and surfactant as disclosed in the instant Specification. Col. 4, lines 1-2 and Examples 1-4; Col. 2, lines 34-37. Sheriff discloses that surfactants are “optional, non-essential components”, and discloses solvents broadly with only a single exemplary solvent, 1-methoxy-2-propanol, but not a synergistic combination of solvent and surfactant. Col. 7, lines 58-61; Col. 8, lines 37-42. Thus, Gracia and Sheriff each fail to provide a teaching that would motivate one skilled in the art to combine Gracia or Sheriff with either of Ebersole or Jeffries (or Kodama) to overcome their deficiencies, and fails to provide a reasonable expectation for the successful combination to provide the method of coating the photoresist composition claimed in Claim 11. Kodama, Gracia, or Sheriff in combination with either Ebersole and/or Jeffries fail to provide a teaching or suggestion that would direct one skilled in the art to the invention as claimed in the instant claims via the limitation of preventing stains in a photoresist film as coated by an MMN head coater with the particular synergistic photoresist composition claimed in the instant claims; and thus fail to provide a teaching or reasonable expectation that staining in a photoresist film can be prevented when coating the large-scale substrate with a photoresist composition specifically comprising a silicon-containing surfactant as claimed in the instant claims.

Thus, Applicants respectfully maintain as argued previously that the claimed combination of components, including the synergistic combination of solvent and surfactant required by the functional limitation of providing a photoresist film without stains when coated using an MMN head coater on a large scale substrate, is not taught in the references individually or in combination, and thus the references do not teach or suggest the photoresist composition as claimed; and that were the references combined,

the combination would nonetheless fail to provide a reasonable expectation that a photoresist combination prepared without the insight provided by the instant specification would be successful, as the combination fails to disclose the synergistic advantage provided by the particular combination of components including solvent and surfactant, in preventing stain formation when the photoresist is applied with the claimed MMN head coater on a large scale substrate, as claimed in the instant claims.

In summary, the combination of Jeffries or Ebersole with Kodama, Sheriff, or Gracia fails to disclose or teach: all elements of the instant claims, and in particular the compositional limitation that the combination of solvent and silicon containing surfactant present in the photoresist prevent stains when coated using an MMN head coater on a large substrate; that there is no teaching or suggestion that would motivate one skilled in the art to formulate a photoresist composition from the combination of references that would prevent stains in a photoresist film prepared from the photoresist composition when coated using an MMN head coater on a large-scale substrate; or that the combined references would as desired prevent stain formation from the unexpectedly synergistic photoresist composition as taught in the instant Specification and as claimed. Thus, the combination of these references does not make unpatentable the instant claims.

It is believed that the foregoing remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance is respectfully requested.

P2003-0000270
OPP031140US
PNK-0205

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Respectfully submitted,

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Date: July 17, 2007